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Teaching and Advocating Green Skills for Students as Social Agents: Sustainability Education Practices of Public-School Teachers at the Secondary Level

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ABSTRACT

Purpose of the study: The study explores how public secondary teachers teach and advocate green skills for students, highlighting the need for promoting sustainable living and economies in the future.

Methodology: Using the descriptive-survey design of quantitative research, eighty-six (86) teachers in public secondary schools in a province in the Philippines are surveyed using a questionnaire with a validity index of 0.98 (excellent) and reliability index of 0.962 (excellent). The gathered data are then analyzed using mean, standard deviation, and t-test.

Main Findings: The findings show that public secondary school teachers emphasize immersive, participatory, and interdisciplinary learning when teaching green skills into their classroom practices, revealing the importance of green skills as integral soci-environmental competencies. However, they still need to provide holistic and comprehensive support for developing these skills outside of the classroom. To ensure a more thorough approach to fostering green skills in students, the curriculum can be enhanced to include sustainable development and environmental literacy, and teachers can get professional development to improve their ability to work with organizations and institutions. The study reveals a discrepancy between the actual teaching of green skills and their advocacy, calling for an intensive and sustainable approach to strengthening academic integration as well as sustainable community practice in green education.

Novelty/Originality of this study: The study contributes to the body of knowledge by examining the extent to which teaching and advocating green skills can lead to improved teacher professional development initiatives and partnerships for sustainable development, thereby bridging the gap between theoretical frameworks and practices.

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1. INTRODUCTION

The need for green skills has grown significantly in today's quickly changing world as businesses look to advance sustainable development in the social, economic, and environmental spheres [1]. The importance of green

skills in promoting sustainability shifts and tackling climate change's difficulties is becoming more widely acknowledged. "Green skills" refers to various capabilities essential for developing, manufacturing, overseeing, and monitoring green technology, such as technical, analytical, and problem-solving [2]. These skills are essential for driving innovation, operating and developing green technology, and ensuring that future professionals are prepared to lead in a sustainable economy [3]. Since they allow people and organizations to lessen their environmental impact and contribute to a more just and equitable society, green skills are seen as a necessary component of sustainability transitions [4]-[7]. Nevertheless, there is a significant study deficit regarding applying green skills in education and their influence on sustainability transitions [4].

Developing the expertise to meet sustainability goals requires integrating green skills into the curriculum and encouraging interdisciplinary research. Institutions of higher learning are essential to this process because they train future professionals to solve environmental issues and advance sustainable practices [3]. Teachers play a key role in teaching students green skills and cultivating a comprehensive sustainability viewpoint. By incorporating green skills into various disciplines, teachers can inspire students to adopt environmentally friendly practices and help preserve the environment [8]. Although green skills are becoming increasingly recognized, it is still unclear what they are and how they differ from other sustainability competencies [9]. Furthermore, there are obstacles to incorporating green skills into education, including the requirement for qualified educators and the ability to use these abilities in real-world situations [8].

Research has discovered five main components of green skills: technological knowledge, waste management knowledge, problem-solving and critical thinking knowledge, behavior, and awareness [10]. Likewise, a study [11] identified five themes of green skills: environmental management, resource-efficiency, carbon management, green product and service development, and sustainability communication. These components are essential to meet the demands of enterprises moving toward green practices to lessen the effects of greenhouse emissions and climate change.

Previous studies of integrating green skills and promoting green education have focused on technical-vocational education [4], [12], [13], tourism education [11], faculty perspectives in higher education institutions [14], especially in the integration of environmental education in teacher education programs [15], students' perspectives from business programs [16], green technology awareness and practices of college students [17], and environmental literacy of pre-service teachers [18]. Few studies focus on teaching green skills at the secondary level [8]. This is the gap that the present study intends to address. However, the present study does not delve only into the integration or teaching of green skills but into the advocacies of teachers to have a comparative analysis between their actual integration and advocacies.

Indeed, green skills must be incorporated into education to address global sustainability issues and equip the next generation to lead in a sustainable economy. Educational institutions may play a crucial role in fostering innovation and sustainable practices by integrating green skills into all subject areas and encouraging interdisciplinary research. More so, there is a pressing need for Filipino teachers to reinforce teaching green skills and education among learners as the Philippines is constantly topping the list of the most disaster-risk and climate change-affected countries in the world [15], [19], [20]. Such entails rigorous education of the population by preparing them for disasters and the impact of climate change through responsive community action and environmental/ecological protection.

In this day and age, it is imperative for teachers to integrate and advocate the development and acquisition of green skills for sustainable development, highlighting the importance of holistic sustainable education and social responsiveness. As noted in the literature, it is important to teach among younger generations and the general population environmental education through knowledge, skills, values, behavioral, attitudinal, and literacy development [21]-[24], environmental sustainability [25], and curriculum development for green education [26]-[27].

As educators, public school teachers are mandated to teach students the value of green skills for sustainable development and continuous improvement. The love for the environment, or makakalikasan in Filipino, has long been enshrined in Philippine education as it is one of the tenets of the National Motto [28] and is also being taught among students [29]. Moreover, there are laws and orders about the national environmental awareness and education [30] and the strengthening environmental education in public and private schools [31] has intensified environmental education in the country's education sector. Public schools are also supported by the Department of Education (DepEd) in promoting green and sustainable education and practices [32], wherein the gulayan sa paaralan (garden in the school), solid waste management and tree planting programs were integrated under the National Greening Program (NGP) [33] aligned with the promulgated by the National Government [34], later expanded [35]. Such laws and policies highlight how Philippine education emphasizes green education and attaining sustainable development goals (SDGs), especially for SDG No. 4 (Quality Education) and SDG No. 17 (Partnership for the Goals).

With that, the present study explores how public secondary teachers teach and advocate green skills for students. This is in response to the preliminary study conducted that compared the green skills integration by student-teachers and cooperating teachers [36], discloing how cooperating teachers are more engaged in green

skills integration than the student-teachers. This preliminary investigation served as the basis for enhancing curriculum and instructional delivery, empowering schools, administrators, teachers, and students.

2. RESEARCH METHOD

2.1 Research Design

The study utilized the descriptive-survey design of quantitative research, wherein the teaching and advocacies of secondary teachers are analyzed based on their responses to a survey questionnaire. The study first described teachers' responses regarding their integration and advocacy of green skills development, then compared these findings to establish baseline insights for promoting sustainable practices in academic settings.

2.2 Respondents

Eight-six (86) public secondary teachers in a province in the Philippines voluntarily and purposively participated in the study. Teacher-respondents were selected based on the following inclusion criteria: (i) at least one year of service in a public school; (ii) assignment to far-flung schools in the province (either upland or coastal); and (iii) residency within the province.

2.3 Research Instrument

The study employed a researcher-developed survey questionnaire as its primary data-gathering tool, which underwent rigorous validation and reliability testing. The questionnaire was reviewed by three education and testing experts, with validation results analyzed using Kappa Statistics, yielding a Context Validity Index (CVI) of 0.98, indicating high validity. Additionally, a dry run with fifteen secondary teachers was conducted, and reliability was assessed using Cronbach's alpha, resulting in a value of 0.962, confirming the instrument's high reliability for the target respondents. Below is a table summarizing the details of the instrument used in the study.

Table 1. Details of the researcher-developed survey questionnaire

Parts	No. of Items	Description of Content
Part I. Teachers' Integration of Green Skills in Instruction	10	This part outlines the strategies for integrating green skills into education, including hands-on activities, research-based learning, problem-solving tasks, technology use, experiential projects, interdisciplinary curriculum links, guest speaker sessions, classroom green practices, and student-led applications through projects and reflections.
Part II. Teachers' Advocacies in Green Skills for Students	10	This part outlines the teachers' advocacies for green skills focus on curriculum integration, leading school sustainability projects, peer education, community and organizational collaborations, modeling eco-friendly classroom practices, developing shared lesson plans, engaging students in environmental service, advancing school-wide green initiatives, promoting professional development in sustainability, and partnering with stakeholders to foster green activities.
Total	20	

2.4 Data Collection Procedure

Before data collection, informed consent was obtained from all teacher-respondents through an online form, which outlined the scope of participation, benefits, and key details of the survey. Consent was confirmed by respondents selecting the agreement icon on the Google Form platform, where the survey was administered at their convenience.

2.5 Statistical Treatment

The gathered data underwent statistical analysis using descriptive statistics, specifically mean and standard deviation, to evaluate teachers' assessments of their integration of green skills in instruction and their advocacy for teaching these skills to students. For comparative analysis, inferential statistics (t-test) were applied to examine differences in teachers' integration and advocacy of green skills.

3. RESULTS AND DISCUSSION

This section provides details on the results of the survey conducted to public secondary teachers on their integration of green skills in instruction and advocacies in promoting green skills among students.

3.1 Teachers' Integration of Green Skills in Instruction

Table 2. Teachers' Integration of Green Skills in Instruction

Items	Mean	Standard Deviation	Description | Interpretation
1. Create activities and initiatives highlighting environmentally conscious behavior and sustainable methods to incorporate green skills into the lesson plans.	3.20	0.61	Often | Practiced
2. Provide practical assignments and agreed tasks that let students use their green knowledge, including starting school recycling programs or energy-saving projects.	3.26	0.60	Always | Highly Practiced
3. Use research-based information, studies, and actual situations to demonstrate the value of green talents across various sectors and professions.	3.20	0.53	Often | Practiced
4. Pose environmental problems to students and help them devise green solutions to foster their critical thinking and problem-solving abilities.	3.15	0.71	Often | Practiced
5. Incorporate educational technology, such as modeling environmental implications through simulations, video presentations, and sustainable technology integration, to enhance the teaching of green skills in the classroom.	3.13	0.61	Often | Practiced
6. Encourage participative, experiential, and immersive learning experiences where students conduct research and give presentations on green practices and technologies in groups.	3.27	0.52	Always | Highly Practiced
7. Integrate green skills within and across curriculum areas to encourage interdisciplinary and multidisciplinary learning and provide thorough knowledge.	3.27	0.52	Always | Highly Practiced
8. Invite guest speakers/resource persons from green industries to share their experiences and perspectives.	1.87	0.89	Seldom | Less Practiced
9. Gain firsthand knowledge of green skills by establishing an environment in the classroom that exemplifies green practices, such as using eco-friendly products, reducing trash, and conserving energy.	3.26	0.60	Always | Highly Practiced
10. Encourage students to apply their knowledge meaningfully through projects, presentations, and reflective diaries to evaluate their grasp of green skills.	2.64	0.94	Always | Practiced
Composite	3.02	0.79	Often | Practiced

Scale of Means: 4 [3.26-4.00 Always | Highly Practiced], 3 [2.51-3.25 Often | Practiced], 2 [1.76-2.50 Seldom | Less Practiced], 1 (1.00-1.75 Never | Not Practiced]

Table 2 presents data on how teachers integrate green skills into their instruction. The most highly practiced methods include encouraging participative, experiential, and immersive learning experiences atmosphere where students conduct research and give presentations on green practices and technologies in groups (M=3.27; SD=0.52) and integrating green skills within and across curriculum areas to foster interdisciplinary and multidisciplinary learning (M=3.27; SD=0.52). Practical assignments and tasks, such as starting school recycling programs or energy-saving projects, are also highly practiced (M=3.26; SD=0.60), as is establishing a classroom environment that exemplifies green practices, such as using eco-friendly products and conserving energy (M=3.26; SD=0.60).

Creating activities and initiatives highlighting environmentally conscious behavior and sustainable methods is often practiced (M=3.20; SD=0.61), and using research-based information to demonstrate the value of green talents across various sectors and professions (M=3.20; SD=0.53). Posing environmental problems to students to foster critical thinking and problem-solving abilities is also frequently practiced (M=3.15; SD=0.71), as is incorporating educational technology to enhance the teaching of green skills (M=3.13; SD=0.61).

Encouraging students to apply their knowledge through projects, presentations, and reflective diaries is practiced to a lesser extent (M=2.64; SD=0.94). The least practiced method is inviting guest speakers from green industries to share their experiences and perspectives (M=1.87; SD=0.89).

Overall, the composite mean score of 3.02 indicates that the integration of green skills is practiced often, with a standard deviation of 0.79 suggesting variability in responses.

The findings show that public secondary school teachers emphasize immersive, participatory, and interdisciplinary learning when integrating green skills into classroom practices. However, they still need to provide holistic and comprehensive support for developing these skills outside the classroom. To ensure a more thorough approach to fostering green skills in students, the curriculum can be enhanced to include sustainable development and environmental literacy, and teachers can get professional development to improve their ability to work with organizations and institutions.

These findings underscore the social responsibility of teachers to educate the public and encourage active participation in initiatives, programs, and activities that drive meaningful societal change. Through such collective and responsive efforts, academic institutions and civil society can collaborate effectively to deliver the transformative changes needed—particularly for marginalized and grassroots communities. Additionally, by fostering environmental awareness among students, teachers play a pivotal role in nurturing learners who contribute meaningfully to nation-building and sustainable development.

The results align with the literature, emphasizing the importance of interdisciplinary approaches and active faculty involvement in sustainability education to prepare students for future challenges [37]. Effective integration of green skills in the classroom demands not only creativity and innovation from teachers but also a strategic, learner-centered approach. As highlighted by a study [38], teachers must go beyond traditional methods to embed innovation and sustainability into their instructional practices. This can be achieved through contextualization of instruction, ensuring that green skills are relevant to local realities and student experiences [39], [40]. Furthermore, promoting interactive learning experiences, such as collaborative activities, problem-solving tasks, and experiential learning, enhances student participation and retention of green concepts [41]. These interactive methods not only make learning more dynamic but also encourage students to apply green skills in real-world scenarios. More so, the development of 21st-century skills is equally critical in this process. Integrating skills like critical thinking, collaboration, and digital literacy into green education prepares students to address sustainability challenges effectively [42]-[44]. This holistic approach ensures that students are not only knowledgeable about sustainability but are also equipped with the skills to innovate and lead in green initiatives. Lastly, a design-thinking framework further strengthens this integration by encouraging teachers and students to approach sustainability challenges with empathy, ideation, and iterative problem-solving [45], [46]-[48]. Design-thinking fosters a mindset of continuous improvement, enabling students to develop practical, scalable solutions for environmental issues.

3.2 Teachers' Advocacies in Green Skills for Students

Table 3. Teachers' Advocacies in Green Skills for Students

Items	Mean	Standard Deviation	Description | Interpretation
1. Participate actively in curriculum development committees to promote the inclusion and integration of green skills in the curricula.	1.79	0.83	Seldom | Less Practiced
2. Encourage green practices in the school by taking the lead on projects such as waste reduction campaigns, recycling programs, and energy-saving projects.	1.77	0.81	Seldom | Less Practiced
3. Inform other educators about the value of green skills and offer tools and methods for implementing them in the classroom.	1.80	0.84	Seldom | Less Practiced
4. Work with neighborhood and environmental groups to host seminars and guest lecturers at the school to help pupils learn more about green skills.	1.99	0.87	Seldom | Less Practiced
5. Set an example of environmentally friendly practices in the classroom by utilizing reusable items, conserving resources, and motivating pupils to follow suit.	1.79	0.80	Seldom | Less Practiced
6. Promote a school-wide approach to sustainability education, create lesson plans and activities emphasizing green skills, and share them with other educators.	2.08	0.92	Seldom | Less Practiced
7. Involve students in environmental-focused community service projects to help them develop a sense of accountability and stewardship.	2.30	1.01	Seldom | Less Practiced
8. Supervise and advance green projects at the school by collaborating with the school administration and local government units.	1.95	0.85	Seldom | Less Practiced
9. Encourage professional development opportunities for educators that emphasize sustainability education and green skills.	1.87	0.85	Seldom | Less Practiced
10. Advocate for environmentally friendly activities, collaborating with industry partners and other stakeholders to promote green initiatives at the school level.	2.38	0.95	Seldom | Less Practiced
Composite	1.97	0.90	Seldom | Less Practiced

Scale of Means: 4 [3.26-4.00 Always | Highly Practiced], 3 [2.51-3.25 Often | Practiced], 2 [1.76-2.50 Seldom | Less Practiced], 1 (1.00-1.75 Never | Not Practiced]

Table 3 presents data on teachers' advocacies in promoting green skills for students. The most practiced advocacy is promoting environmentally friendly activities by collaborating with industry partners and other stakeholders to advance green initiatives at the school level (M=2.38; SD=0.95). Involving students in

environmental-focused community service projects to foster a sense of accountability and stewardship is also relatively well-practiced (M=2.30; SD=1.01).

Promoting a school-wide approach to sustainability education by creating lesson plans and activities emphasizing green skills and sharing them with other educators is practiced to a lesser extent (M=2.08; SD=0.92). Working with neighborhood and environmental groups to host seminars and guest lecturers to educate students about green skills is less frequently practiced (M=1.99; SD=0.87).

Supervising and advancing green projects at the school through collaboration with the school administration and local government units is also less practiced (M=1.95; SD=0.85). Encouraging professional development opportunities for educators focusing on sustainability education and green skills is similarly less practiced (M=1.87; SD=0.85).

Informing other educators about the value of green skills and offering tools and methods for classroom implementation is less frequently practiced (M=1.80; SD=0.84). Setting an example of environmentally friendly practices in the classroom by using reusable items and conserving resources is also less practiced (M=1.79; SD=0.80).

Participating actively in curriculum development committees to promote the inclusion and integration of green skills in the curricula is less frequently practiced (M=1.79; SD=0.83). The least practiced advocacy is encouraging green practices in the school by leading projects such as waste reduction campaigns, recycling programs, and energy-saving projects (M=1.77; SD=0.81).

The composite mean score of 1.97 indicates that these advocacies are generally less practiced, with a standard deviation of 0.90 suggesting response variability.

According to the statistics, teachers' advocacies to promote green skills in the classroom, school, and community are typically less observed, with the most common strategies emphasizing teamwork and community involvement. The most popular advocacies are enlisting students in community service initiatives and promoting eco-friendly activities through stakeholder participation. However, initiatives like spearheading the push for eco-friendly school projects and practices, as well as participating in curriculum development to incorporate eco-friendly skills are conspicuously lacking in support. The low mean score emphasizes the need for additional advocacy and support to integrate green skills into educational settings better, even while variability shows inconsistent implementation across different contexts.

The results highlight the need for increased advocacy and support to better integrate green skills into educational settings. This aligns with literature that emphasizes the importance of fostering a pro-environmental school culture to enhance student engagement and promote sustainability despite challenges in motivating students to participate in climate-friendly actions [49], [50]. To effectively implement advocacy for green skills and education, teachers must adopt a structured, multi-faceted approach that begins with a well-defined curriculum integration plan and fosters partnerships with stakeholders [36]. This process requires identifying learners' challenges, particularly those tied to pressing environmental and social issues, to tailor interventions that address real-world concerns [51]. By contextualizing instruction through innovative intervention materials, such as self-learning kits and QR-based resources, educators can bridge gaps in understanding and engagement [52], [53]. Ultimately, as noted [39] emphasizes, educators serve as catalysts for societal change, empowering students to become proactive advocates for sustainability in their communities with sensitivity [54], [55].

3.3 Comparison Between the Teachers' Integration and Advocacy on Green Skills for Students

Table 4. Comparison Between the Teachers' Integration and Advocacy on Green Skills for Students

Group	Mean	SD	t-value	p-value	Remarks | Decision
Integrating Green Skills	3.02	0.79	6.20	0.00	Significant | Do Not Accept H_0
Advocating Green Skills	1.97	0.90			

In Table 4, the comparison between integrating and advocating green skills for students reveals a significant difference in their implementation. Integrating green skills is more frequently practiced, with a mean score of 3.02 and a standard deviation of 0.79, indicating that teachers often integrate these skills into their instruction. In contrast, advocating for green skills has a lower mean score of 1.97 and a standard deviation of 0.90, suggesting that efforts to promote and support green initiatives beyond the classroom are less common. The t-value of 6.20 and a p-value of 0.00 confirm that this difference is statistically significant, highlighting the need for increased advocacy to complement the existing integrating practices and enhance the overall impact of green skill education advocacies.

Even though teachers frequently include green skills in their lessons, there are surprisingly few initiatives to support these skills outside of the classroom, as evidenced by the gap between advocacy and instruction. More attention must be paid to promoting green initiatives at the school level to enhance present integrating strategic advocacies and boost the overall efficacy of green skill instruction.

Although teachers frequently include green skills in their lessons, the results show a disconnect between advocacy and integration because there aren't enough programs to support these talents outside of the classroom. This aligns with the literature emphasizing the crucial role of teachers in promoting sustainable development and the need for a reorientation of teacher education to emphasize systems thinking and citizen participation in achieving sustainability goals [56] to catalyze change in the academe and in the larger society [57].

4. CONCLUSION

The public secondary teachers practiced integrating the teaching of green skills among students in their instruction, significantly highest in terms of encouraging participative, experiential, and immersive learning experiences where students conduct research and give presentations on green practices and technologies in groups and integrating green skills within and across curriculum areas to encourage interdisciplinary and multidisciplinary learning and provide thorough knowledge. However, the teachers least practiced advocacies in promoting green skills for students, with their advocacies mainly focused only on advocating for environmentally friendly activities, collaborating with industry partners and other stakeholders to promote green initiatives at the school level, and involving students in environmental-focused community service projects to help them develop a sense of accountability and stewardship. Notably, a significant difference has been noted between teachers' teaching integration and advocacies in promoting students' green skills, as their teaching is significantly higher than their actual advocacies conducted.

In line with those findings above, it is recommended that public school teachers be provided with technical assistance or any professional development endeavor empowering them to effectively affiliate with organizations or institutions that will help them realize their advocacies in promoting green skills among students. More so, revisiting the curriculum to effectively integrate the teaching and advocacies for green skills, incorporating environmental literacy and sustainable development may also be facilitated.

Future researchers may conduct an action research on the innovative practices of public-school teachers integrating and teaching green skills to the learners. More so, a community-based research may also be conducted on how green and sustainable education initiatives transform the lives of the people in the community.

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REFERENCES

[1] L. C. Sern, A. F. Zaime, and L. M. Foong, "Green skills for green industry: A review of literature," in *Proc. 1st Int. Conf. Green Sustain. Comput. (ICoGeS)*, 2018, pp. 1–8. doi: 10.1088/1742-6596/1019/1/012030.
[2] K. Likhitha and V. Srinivas, "Green skill development for sustainable employment: A study on enhancing workforce competency," 2023.
[3] Paeradigms, *Integrating green skills into higher education teaching and research*. Union Mediterr., 2024.
[4] M. Fuchs, "Green skills for sustainability transitions," *Geogr. Compass*, vol. 18, no. 10, pp. 1–12, 2024. doi: 10.1111/gec3.70003.
[5] UNESCO, "Greening TVET," 2022.
[6] UNESCO and UNEVOC, *Greening technical and vocational education and training: A practical guide for institutions*. Messner, 2017.
[7] UNIDO, "What are green skills?" 2022.
[8] A. Kamis *et al.*, "Exploring green skills: A study on the implementation of green skills among secondary school students," *Int. J. Acad. Res. Bus. Soc. Sci.*, vol. 7, no. 12, pp. 327–345, 2017. doi: 10.6007/IJARBSS/v7-i12/3615.
[9] O. Wegenberger and I. Ponocny, "Green skills are not enough: Three levels of competences from an applied perspective," *Sustainability*, vol. 17, no. 1, pp. 1–22, 2025. doi: 10.3390/su17010327.
[10] Z. Ibrahim *et al.*, "Green skills in knowledge and attitude dimensions from the industrial perspective," in *Proc. Int. Conf. Technol., Eng. Sci. (ICTES)*, 2020, pp. 1–8. doi: 10.1088/1757-899X/917/1/012025.
[11] S. M. Renfors, "Supporting green transition in the Finnish tourism sector by identifying green skills," *Eur. J. Tour. Res.*, vol. 36, pp. 1–16, 2024. doi: 10.54055/ejtr.v36i.3223.
[12] B. L. Ismail *et al.*, "Integrating element of green skills in the 21st century learning," in *Proc. 3rd Int. Conf. Educ.*, vol. 3, 2017, pp. 305–314. doi: 10.17501/icedu.2017.3131.
[13] S. D. James *et al.*, "A survey of facility management green skills competency among TVET educators and students in a public university in Malaysia," *Proc. Comput. Electr. Educ. Res. (PROCESSOR)*, 2023.
[14] M. Z. A. Hamid *et al.*, "Generic green skills in teaching and learning: Meaning and implementation," *Univ. J. Educ. Res.*, vol. 7, no. 12A, pp. 121–126, 2019. doi: 10.13189/ujer.2019.071915.
[15] B. M. D. Cruz, "Philippines is still most disaster-prone country for 16th straight year," *BusinessWorld Publ.*, Sep. 10, 2024.

[16] T. Balcarova, J. Pitrova, and L. Pilařová, "Sustainability and green skills education: Current state of student's knowledge in four EU countries," in *Proc. 16th Annu. Int. Conf. Educ., Res. Innov. (ICERI2023)*, 2023, pp. 5598–5604. doi: 10.21125/iceri.2023.1395.
[17] M. L. Gonzaga, "Awareness and practices in green technology of college students," *Appl. Mech. Mater.*, vol. 848, pp. 223–227, 2016. doi: 10.4028/www.scientific.net/AMM.848.223.
[18] C. J. M. Manguil, "Environmental literacy among pre-service teachers towards integrating green technology into the classroom," *J. Interdiscip. Perspect.*, vol. 2, no. 12, 2024. doi: 10.69569/jip.2024.0577.
[19] The World Bank Group, "Philippines," *Climate Knowl. Portal*, 2021.
[20] E. B. Salas, "Global disaster risk index 2024, by select country," *Statista*, Feb. 11, 2025.
[21] N. Hidayati, A. Nugraha, N. H. Wijaya, and H. Mulyati, "The influence of environmental knowledge on green supply chain management in achieving business performance and sustainability performance of culinary MSMEs in Indonesia," J. Environ. Sustain. Educ., vol. 4, no. 1, pp. 114–130, 2026, doi: 10.62672/joease.v4i1.155.
[22] A. Nurkhin et al., "The relationship between student environmental education, knowledge, attitude, and behavior," J. Environ. Sustain. Educ., vol. 3, no. 3, pp. 331–339, 2025, doi: 10.62672/joease.v3i3.94.
[23] A. D. R. Pramana, T. M. P. Astuti, M. Malarsih, and S. S. Sinaga, "Embodied pedagogy and ecological ethics: Internalising environmental values through the Pakarena Anida dance in South Sulawesi," J. Environ. Sustain. Educ., vol. 3, no. 3, pp. 369–376, 2025, doi: 10.62672/joease.v3i3.122.
[24] A. S. Shidiq et al., "Inquiry based experiments to enhance sustainability literacy: A systematic literature review and bibliometric analysis," J. Environ. Sustain. Educ., vol. 3, no. 2, pp. 287–303, 2025, doi: 10.62672/joease.v3i2.98.
[25] T. T. H. Tran, "Teaching environment and sustainability: Experiences of a Vietnamese educator living in Canada," J. Environ. Sustain. Educ., vol. 2, no. 2, pp. 61–72, 2024, doi: 10.62672/joease.v2i2.27.
[26] I. M. D. M. Adnyana, K. A. Mahendra, and S. M. Raza, "The importance of green education in primary, secondary and higher education: A review," J. Environ. Sustain. Educ., vol. 1, no. 2, pp. 42–49, 2023, doi: 10.62672/joease.v1i2.14.
[27] M. Mellyzar et al., "Is higher education curriculum prepare to support sustainable environmental chemistry learning?," J. Environ. Sustain. Educ., vol. 3, no. 3, pp. 414–434, 2025, doi: 10.62672/joease.v3i3.100.
[28] "An act prescribing the code of the national flag, anthem, motto, coat-of-arms and other heraldic items and devices of the Philippines," Rep. Act No. 8491, Feb. 12, 1998.
[29] DepEd, "Our Department of Education Vision, Mission and Core Values (DepEd VMV)," DepEd Order No. 36, s. 2013, Sep. 4, 2013.
[30] "An act to promote environmental awareness through environmental education and for other purposes," Rep. Act No. 9512, Dec. 12, 2008.
[31] DepEd, "Strengthening environmental education in public and private schools," DepEd Order No. 52, s. 2011, Jul. 5, 2011.
[32] DepEd, "Two PH public high schools win SEAMEO awards for sustainable development initiatives," 2021.
[33] DepEd, "Implementing guidelines on the integration of gulayan sa paaralan, solid waste management and tree planting under the national greening program (NGP)," DepEd Order No. 5, s. 2014.
[34] "Declaring an interdepartmental convergence initiative for a national greening program," Exec. Order No. 26, s. 2011, Feb. 24, 2011.
[35] "Expanding the coverage of the national greening program," Exec. Order No. 193, s. 2015, Nov. 12, 2015.
[36] R. R. Pecson and A. A. Zabala, "Green skills integration practices of student teachers and cooperating teachers among secondary schools: Basis for enhanced instructional plan," *J. Environ. Sustain. Educ.*, vol. 3, no. 1, pp. 43–49, 2025. doi: 10.62672/joease.v3i1.54
[37] A. G. Abo-Khalil, "Integrating sustainability into higher education: Challenges and opportunities for universities worldwide," *Heliyon*, vol. 10, no. 9, pp. 1–13, 2024. doi: 10.1016/j.heliyon.2024.e29946.
[38] R. R. Pecson, "Innovation skills of secondary teachers: Trajectory for technical assistance," *Int. J. Appl. Educ. Res. (IJAER)*, vol. 3, no. 5, pp. 287–296, 2025. doi: 10.59890/ijaer.v3i5.123.
[39] R. R. Pecson, "Localization and contextualization in teaching K-12 Social Studies," Jun. 01, 2014.
[40] R. R. Pecson and F. E. Morales, "Praxes for culturally responsive teaching (CRT) in basic and higher education," *J. Bs. Edu. R*, vol. 7, no. 1, pp. 56–65, Jan. 2026. doi: 10.37251/jber.v7i1.2696.
[41] R. R. Pecson, "Interactive word guessing games: Enhancing the conceptual learning of Grade 8 and Grade 9 high school students in social studies," Feb. 21, 2015.
[42] G. C. Magno, N. G. Bardemorilla, and R. R. Pecson, "Student teachers and cooperating teachers' practices in the 21st century classroom: Developing 21st century skills among learners," *Int. J. Soc. Sci. Humanit. Res.*, vol. 4, no. 3, pp. 539–546, 2016.
[43] R. R. Pecson and J. Sarmiento, "Integrating 21st-century skills into instructional materials for sustainable education," *Indones. J. Instr. Media Model*, vol. 6, no. 2, pp. 89–99, 2024. doi: 10.32585/ijimm.v6i2.5934.
[44] R. R. Pecson and J. R. Sarmiento, "Student teaching and instructional materials in the 21st-century classroom: A literature review," *Indones. J. Teach. Sci.*, vol. 5, no. 1, pp. 55–60, 2025. doi: 10.17509/ijotis.v5i1.82628.
[45] R. R. Pecson and M. S. Romero, "Design-based thinking among secondary student-teachers: Input for a contextualized teaching plan," *Int. J. Adv. Res. Innov. Ideas Educ.*, vol. 9, no. 4, pp. 2557–2569, 2023.
[46] R. R. Pecson, L. C. Canare, L. T. Olubia, M. S. Romero, and G. C. Adraneda, "Juxtaposing design-based thinking practices of secondary student-teachers during the internship program: Input for an improved pre-service training," *Soc. Sci., Humanit. Educ. J. (SHE J.)*, vol. 5, no. 2, pp. 387–392, 2024. doi: 10.25273/she.v5i2.20977.
[47] R. R. Pecson, L. C. Canare, L. T. Olubia, M. S. Romero, and G. C. Adraneda, "Dichotomy of design-based thinking intentions and practices among secondary student-teachers: Input for an instructional design teaching handbook," *Int. J. Soc. Educ.*, vol. 1, no. 7, pp. 1892–1901, 2024.

[48] L. C. Canare, R. R. Pecson, L. T. Olubia, M. S. Romero, and G. C. Adraneda, "Design-based thinking intentions among secondary student-teachers: Implications to instructional delivery," *Indones. J. Educ. (INJOE)*, vol. 4, no. 3, pp. 692–700, 2024.

[49] E. Yli-Panula, E. Jeronen, and S. Mäki, "School culture promoting sustainability in student teachers' views," *Sustainability*, vol. 14, no. 12, pp. 1–26, 2022. doi: 10.3390/su14127440.

[50] D. Tanubrata, A. Purwanto, and S. Budi, "The influence of pro-environmental school culture on green school implementation with students' environmental awareness as a mediating variable," *Int. J. Curr. Sci. Res. Rev.*, vol. 7, no. 12, pp. 8660–8671, 2024. doi: 10.47191/ijcsrr/V7-i12-02.

[51] R. R. Pecson, "Effectiveness of QR-based modified strategic intervention materials in improving the academic performance of SHS students in Disciplines and Ideas in the Social Sciences," *Indones. Educ. Res. J.*, vol. 3, no. 2, pp. 52–61, 2025. doi: 10.56773/ierj.v3i2.88.

[52] R. R. Pecson, "Self-learning kit in improving the academic performance of senior high school students," May 14, 2020.

[53] R. R. Pecson, "Pagtataya ng mga gurong mag-aaral sa mga salik kung bakit nahihirapan ang mga sekundaryang mag-aaral sa pag-aaral ng Araling Panlipunan (Assessment of student-teachers on the factors why the secondary students encountered difficulties in learning Social Studies)," *Int. J. Res.*, vol. 12, no. 7, pp. 155–164, 2025. doi: 10.5281/zenodo.16562310.

[54] N. Lugtu and R. R. Pecson, "Disarming words: Pre-service teachers' pedagogical approaches in catapulting language sensitivity toward a harmonized instructional plan," *Int. J. Teach. Learn. (INJOTEL)*, vol. 3, no. 1, pp. 30–45, 2025.

[55] R. R. Pecson and N. M. Lugtu, "Pre-service teachers' language sensitivity experiences and endeavors during internship program: Insights for character and social education," *Jo. Soc. Know. Ed.*, vol. 7, no. 1, pp. 78–88, Jan. 2026. doi: 10.37251/jske.v7i1.2700.

[56] T. Ferguson, C. Roofe, and L. D. Cook, "Teachers' perspectives on sustainable development: The implications for education for sustainable development," *Environ. Educ. Res.*, vol. 27, no. 9, pp. 1343–1359, 2021. doi: 10.1080/13504622.2021.1921113.

[57] R. R. Pecson, *Ecological check, Mother Earth is deteriorating: Educators' Role in environmental education*, Nov. 2014.